Appln. No. 09/370,178
Response dated September 17, 2004
Reply to Office Action of June 18, 2004

REMARKS/ARGUMENTS

Rejections under 35 USC §103(a)

The Examiner has maintained her rejection of Claims 1-11 and 14-20 over Blaker et al. (U.S. Patent 5,550,870) in view of Hladik et al. (U.S. Patent 5,721,745) and Claims 12 and 13 over Blaker et al. (U.S. Patent 5,550,870) in view of Hladik et al. (U.S. Patent 5,721,745) and Belveze et al. (U.S. Patent 6,389,574). Applicants respectfully disagree with the outstanding rejection stating as follows.

Blaker et al. is understood to utilize a classical Viterbi algorithm. As such, Blaker et al. estimates the entire coded block of data and maximizes the probability of entire data blocks. This is realized by an accumulating soft metric and trace back over the trellis and making a hard decision at the final stage. Hladik et al. is understood to utilize MAP (Maximum A posterior Probability). As such, Hladik et al. uses two-directional processing in a forward-and-backward manner. Hladik et al. is understood to compute exact probability for each bit (rather than entire data block) without any approximation which includes the drawback that the decoding latency is very high.

The SOVA (soft output viterbi algorithm) decoder used in the present invention uses one-directional processing. The present invention makes a selection to choose the survivor path in the form of a hard decision on those survivor paths and therefore the information on the non-survivor path is discarded. The benefit of this approach is the minimum decoding latency.

From a high level overview, the processing architecture of the present invention differs from the cited prior art. The present invention uses one-directional processing as SOVA to achieve the minimum decoding latency, but also uses the exact probability computing for each bit as MAP to achieve the best performance. In contrast, Blaker et al. is a classical Viterbi algorithm utilizing MLSE (maximum likelihood sequence estimation) and the output is a hard decision. Further, Hladik et al. appears to be a pure MAP algorithm. The combination of these two references should therefore include some motivation suggested by one or both of

the references that results in the Applicants' instant invention. Respectfully, Applicants submit that no such motivation can be found that would result in the combinations made by the Examiner that results in the Applicants' instant invention as explained further hereinbelow.

Among the present invention and the prior art cited, the vector definitions are different. In Hladik et al., the vector (length L) represents the time direction and appears to only decode the serial single bit stream. In such case, a higher QAM (2^q) modulation will require that the demodulation be performed to demap the QAM (q-ary multi-bit stream) into a single bit serial bit stream with length K x L. Blaker et al. has the same bit demaping arrangement as Hladik et al. However, the present invention includes a vector that, in addition to the time dimension (vector representation), represents multiple bit streams for the case of higher QAM modulation while the decoding length (time) is shortened to L only (q-times reduction). It is important to note that the present invention performs the q-ary modulation decoding in concurrent q parallel bit streams in the same trellis length. In doing this, the present invention presents a novel decoding time reduction. This feature of q-ary modulation decoding in concurrent q parallel bit streams in the same trellis length is believed to be explicit in the text of Claims 3 and 4 (which have now been made independent Claims), as well as in the text of Claim 8.

Applicants further submit that the metrics of the prior art methods and that of the present invention are different. Blaker et al. uses the compound channel weighted received signal to compute the metrics such as Euclidian or Manhattan distance as the soft value for the path selection. Hladik et al. uses the *a posterior* probability as the metric for each bit. The present invention includes two probability representations (See Applicant's specification page 9, lines 1-9). While such probability representations can be combined to represent the LLR value, the present invention computes the q parallel streams for the binary bit probability and only in the BPSK (binary phase shift keying) modulation technique case can it be simplified into LLR representation. It is clear that the metric processing for the present invention is different than the cited references in the aspect that the present invention always produces and maintains the q parallel bit stream probabilities for each state.

Still further, Applicants submit that the survivor path processing in accordance with the present invention differs from that of the cited references. Blaker et al. uses an approach that

prunes the trellis's at the level of Nc-1 depth and uses the track back to decide one from two survivor and competing paths. Hladik et al. uses an iterative update to the LLR for each bit forward and backward. As suggested in Applicants' specification at page 7, lines 16-18, the present invention utilizes a one pass approach with no forward/backward iteration or trace-back operation. Applicants' have amended each remaining independent claim to positively recite this feature. As such feature was believed to implicitly exist in each of the independent claims prior to amendment, the Applicants respectfully submit that no new issue exists that would necessitate further search or consideration.

Claims 1 through 7 have been deleted. Claims 8, 15, and 18 have been amended. Claims 9-14, 16-17, and 19-20 remain unchanged.

Applicant respectfully submits that the subject matter defined by Claims 8 through 20 is not obvious from any one, or a combination, of Blaker et al., Hladik et al. and Belveze et al. and thus are allowable.

Conclusion

Applicant respectfully submits that the above arguments are fully responsive to the outstanding Office Action and requests entry of the related amendment. No new matter or new issues have been introduced. Reconsideration and allowance of Claims 8-20 is solicited. If the Examiner does not receive the foregoing remarks in a positive light, she is earnestly requested to contact the undersigned by telephone in order to advance the application.

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In addition, we note that the Office Action was mailed to the previous agents of record. Please find enclosed copy of a Notice of Acceptance of Power of Attorney which appoints the petitioners of Customer No. 26123.

The Commissioner is hereby authorized to charge any additional fees, and credit any overpayments to Deposit Account No. 501593, in the name of Borden Ladner Gervais LLP.

                                        Respectfully submitted,

                                        LI, Bin; et al

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DRH/djr/ats
Encl.
1. Notice of Acceptance of Power of
Attorney

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